EXPEDIENT COFFERDAM TECHNOLOGY FOR REPAIR OF GATED DAMS/LEVEES

J. E. Fowler, J. A. Padula, D. T. Resio, D. L. Ward, D. D. Abraham, S. J. Boc, U. S. Army Engineer Research & Development Center, Vicksburg, Mississippi 39180; jimmy.e.fowler@usace.army.mil; joseph.a.padula@usace.army.mil;

Abstract This paper presents results of investigations into the potential application of high strength, light weight fabric tubes for rehabilitation or replacement of aging or damaged control gates used in hydroelectric or navigation structures. The fabric tubes would function as expedient temporary cofferdams that facilitate de-watering of the working area. At far too many hydroelectric and navigation structures around the United States, safety and economic concerns associated with water control gates are common. The process for rehabilitation or replacement of existing gates presents numerous challenges, but likely the biggest is the ability to quickly create a safe de-watered working area. Researchers at the US Army Engineer Research and Development Center (ERDC) are presently investigating a new system that features high strength fabric tubes that could be quickly deployed to provide a de-watered working area for such repair efforts. The concept involves the use of water-filled tubes that are fabricated such that the shape formed when filled with water is an arch with diameter that is sized according to the width of structure to be dewatered

One of the key design considerations relates to the amount and strength of material required for the tube to operate properly under internal pressure and external loads. Experiments run for this project were conducted at a scale of 1:16 using fabric tubes in a variety of sizes and configurations. The tubes were constructed of polyvinyl chloride-coated fabric weighing 10 oz per square yard and reinforced with woven nylon straps. Initial tests were conducted for a relatively simple situation, using a single large tube designed to provide a de-watered area that could enable a gate having length of 50.0 ft with an “upstream” depth of 15 feet to be accessed for maintenance or replacement. Load cells and pressure gages were used to measure internal pressures and key loads, including hoop tension (tension in the material around the circumference of a tube) and restraining forces. Initial test results have been promising, well within the range of materials available for use with a full scale system. It is believed that a wide class of available fabrics from reinforced polyurethanes and vulcanized rubber products would be sufficient in terms of both hoop tension and longitudinal loads. Additional experiments are planned to examine potential use of multiple stacked tubes, methods of deployment, and other potential uses of this promising new technology.